

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

COMPLETE LISTING OF CLAIMS:

Claims 1-19 : (Canceled)

Claim 20 : (New) A method of providing counter-pumped Raman amplification in a wavelength division multiplex (WDM) optical communication system that includes a transmission optical fiber for guiding WDM radiation having a transmission waveband and at least one Raman pump laser for generating pump radiation having a respective pump wavelength, the transmission fiber having a zero dispersion wavelength lying midway between the transmission waveband and the pump wavelength, the method comprising the step of: de-correlating longitudinal modes of the pump radiation before coupling the pump radiation into the transmission fiber in a counter propagating direction with respect to the WDM radiation.

Claim 21 : (New) The method according to claim 20, in which the pump laser is a fiber Raman laser.

Claim 22 : (New) An optical wavelength division multiplex (WDM) communication system comprising:

a) a transmission optical fiber for guiding WDM radiation having a transmission waveband;

b) at least one Raman pump laser for generating pump radiation having a respective pump wavelength;

c) coupling means for coupling the pump radiation into the transmission optical fiber in a counter propagating direction with respect to a direction of propagation of the WDM radiation;

d) the transmission fiber having a zero dispersion wavelength lying midway between the transmission waveband and the pump wavelength; and

e) de-correlating means for de-correlating longitudinal modes of the pump radiation before it is coupled into the transmission fiber.

Claim 23 : (New) The communication system according to claim 22, in which the pump laser is a fiber Raman laser.

Claim 24 : (New) The communication system according to claim 22, in which the de-correlating means includes a length of optical fiber having dispersive or non-linear characteristics for de-correlating the longitudinal modes of the pump radiation.

Claim 25 : (New) The communication system according to claim 24; and further comprising a filter between a length of the fiber and the coupling means, for blocking spontaneous emission produced by the Raman effect in the length of the fiber.

Claim 26 : (New) The communication system according to claim 22, in which the de-correlating means comprises a first optical coupler for dividing the pump radiation to propagate along first and second optical paths; a delay element included within one of the optical paths; and additional coupling means for re-combining the pump radiation from the first and second optical paths.

Claim 27 : (New) The communication system according to claim 26, in which the delay element comprises a length of optical fiber whose length is sufficient to de-correlate the longitudinal modes of the pump radiation.

Claim 28 : (New) The communication system of claim 22, in which the de-correlating means comprises a polarization divider for dividing the pump radiation to propagate along first and second optical paths; a delay element included within one of the optical paths; and a polarization combiner for re-combining the pump radiation from the first and second optical paths.

Claim 29 : (New) The communications system according to claim 28, in which the delay element comprises a length of optical fiber whose length is sufficient to de-correlate the longitudinal modes of the pump radiation.

Claim 30 : (New) The communications system according to claim 22; and further comprising a plurality of Raman pump lasers each for generating pump radiation having a respective different pump wavelength; a respective de-correlating means for de-correlating the longitudinal modes of the pump radiation; and multiplexing means for combining the pump radiation.

Claim 31 : (New) A Raman pump module for generating pump radiation having a pump wavelength for coupling into a transmission fiber of an optical wavelength division multiplex (WDM) communication system to provide Raman amplification of WDM radiation counter propagating therethrough, the WDM radiation having a transmission waveband, the transmission fiber having a zero dispersion wavelength lying midway between the transmission waveband and the pump wavelength, the module comprising:

a) a Raman pump laser for generating the pump radiation; and
b) de-correlating means for de-correlating longitudinal modes of the pump radiation before it is coupled into the transmission fiber.

Claim 32 : (New) The Raman module according to claim 31, in which the pump laser is a fiber Raman laser.

Claim 33 : (New) The Raman module according to claim 31, in which the de-correlating means includes a length of optical fiber having dispersive or non-linear characteristics for de-correlating the longitudinal modes of the pump radiation.

Claim 34 : (New) The Raman module according to claim 33; and further comprising a filter for blocking spontaneous emission produced by the Raman effect in the length of fiber.

Claim 35 : (New) The Raman module according to claim 31, in which the de-correlating means comprises a first optical coupler for dividing the pump radiation to propagate along first and second optical paths; a delay element included within one of the optical paths; and coupling means for re-combining the pump radiation from the first and second optical paths.

Claim 36 : (New) The Raman module according to claim 35, in which the delay element comprises a length of optical fiber whose length is sufficient to de-correlate the longitudinal modes of the pump radiation.

Claim 37 : (New) The Raman module according to claim 31, in which the de-correlating means comprises a polarization divider for dividing the pump radiation to propagate along first and second optical paths; a delay element included within one of the optical

paths; and a polarization combiner for re-combining the pump radiation from the first and second optical paths.

Claim 38 : (New) The Raman module according to claim 37, in which the delay element comprises a length of optical fiber whose length is sufficient to de-correlate the longitudinal modes of the pump radiation.